

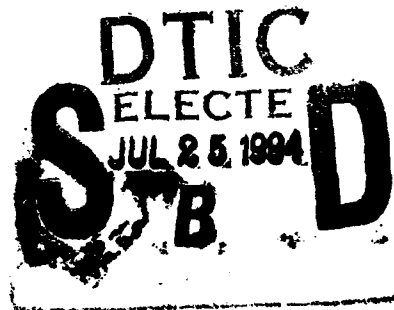
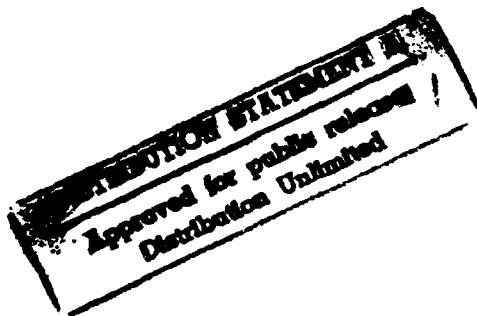
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**A RAND NOTE**

**Methodology for Examining Effects of Arms  
Control Reduction on Tactical Air Forces:  
An Example from Conventional Forces in  
Europe (CFE) Treaty Analysis**

**Charles T. Kelley, Jr.**



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**Charles T. Kelley, Jr.**

**Prepared for the  
United States Air Force**

**RAND**

**Approved for public release; distribution unlimited**

## PREFACE

This Note grew out of a request by the Commander in Chief, United States Air Forces in Europe (USAFE), to investigate issues associated with the possible reduction of NATO and Warsaw Pact tactical air forces in the European theater. The study was sponsored through the Office of USAFE's Deputy Chief of Staff, Plans. Project AIR FORCE undertook the study as part of its National Security Strategies Program. The results of this analysis were widely presented in briefings throughout the U.S. and allied defense communities in the fall of 1989 and spring of 1990 during the period when the Conventional Forces in Europe (CFE) Treaty was being negotiated. The portions of the recently signed CFE Treaty that deal with the subject of tactical air reductions contain features that are similar to those described here.

This Note is being published now because it provides a public record of our research and because it addresses issues that may resurface if additional arms control negotiations follow successful implementation of the CFE Treaty. It should interest force planners and those involved in force reductions and arms control negotiations.

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## **SUMMARY**

In May 1989, NATO proposed that a ceiling be established for Warsaw Pact and NATO tactical aircraft within the ongoing Conventional Forces in Europe (CFE) arms reduction negotiations. Specifically, NATO proposed that the ceiling for tactical aircraft be set 15 percent below the then-current NATO level. After the NATO initiative to consider tactical air reductions in the CFE negotiations was announced, Project AIR FORCE was asked by the Commander in Chief of the U.S. Air Forces in Europe to examine a number of issues associated with potential CFE tactical air reductions. Two of the principal issues considered in this research were

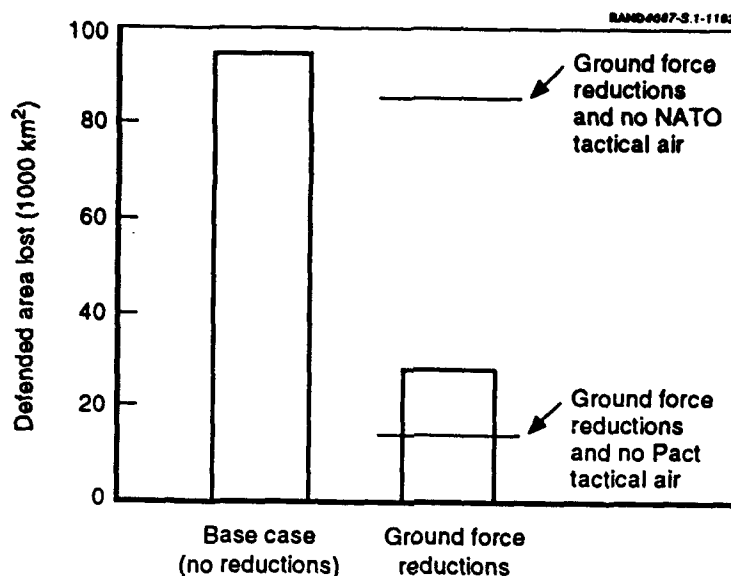
- How should a tactical air reduction agreement be structured?
- How should NATO implement such an agreement?

To address these issues, we examined the effects of alternative arms control agreements and alternative implementations of those agreements on the tactical air balance in the Atlantic-to-the-Urals (ATTU) region. We also explored the effects of these options on the outcome of a 20-day air-land campaign in NATO's Central Region. Because this study took place before the reunification of Germany and the effective dissolution of the Warsaw Pact, the campaign consisted of a classic Warsaw Pact attack on West Germany.

## **STRUCTURING A CONVENTIONAL ARMS CONTROL AGREEMENT**

Virtually all analyses of the pre-CFE European military balance showed a substantial danger of Warsaw Pact breakthrough and seizure of large amounts of NATO territory. The danger held for almost any assumptions about warning and mobilization times because of the preponderance of Pact armor, artillery, and other ground forces. The CFE ground force proposals that were presented by NATO and the Warsaw Pact were similar (and at the time likely to be agreed upon), essentially eliminating this asymmetry. Our analysis indicated that the major benefit to NATO of a CFE agreement would be the very large reductions in Pact ground forces. This benefit is shown in Fig. S.1, where the two bars contrast our estimates of the defended area NATO would lose in the Central Region in 20 days of conflict before and after the likely ground force reductions have taken place. At the time these

proposals were being made, however, one obstacle to achieving this benefit was agreement on how the opposing tactical air forces were to be reduced. The criticality of tactical air to the defense of NATO territory is shown in Fig. S.1 by the two additional horizontal lines, which represent the change in area lost for extreme cases in which tactical air is unavailable to one or the other adversary. It is clear from this figure that tactical air was far more important to NATO than to the Warsaw Pact.

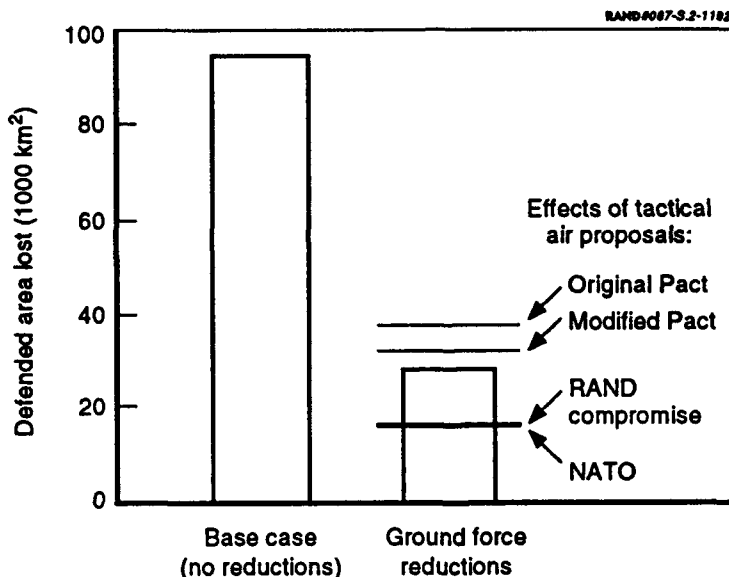


**Figure S.1—Effects of Ground Force Reductions on NATO Losses Are Dramatic**

The original NATO and Pact tactical air reduction proposals were quite far apart. According to the NATO definition, all combat aircraft based in the ATTU region would be subject to reduction. The original Pact proposal was much less inclusive, calling only for reductions in "tactical strike aviation," which includes NATO's nuclear-capable fighter-bombers. Later, however, the Warsaw Pact modified its proposal to conform more to the NATO proposal, although the Pact still wanted to exclude trainers (of all types), medium bombers (including land-based naval aircraft), and Soviet homeland air defense interceptors. We believed that common ground for a compromise between the NATO and Pact positions could be found if the Pact was willing to distinguish between basic and advanced trainers, if the two sides could agree on a mutual exclusion for some land-based naval aircraft, and if NATO was willing to exclude some Soviet homeland interceptors from the reductions. However,

we recommended a cap on the numbers of all excluded aircraft in order to restrain growth in those categories.<sup>1,2</sup>

Although the more inclusive NATO tactical air proposal would have been the most beneficial to the West, none of the three proposals—the original Pact proposal, the original NATO proposal, and the modified Pact proposal—was grossly disadvantageous. This point is illustrated in Fig. S.2, which superimposes our estimates of how all three tactical air proposals and our suggested compromise would affect the NATO area lost in a 20-day campaign. Note that this study was completed before the CFE Treaty was signed, so no campaign analysis was performed on the actual force reductions specified in the treaty. However, we expect that the result of such an analysis would fall somewhere between the result for no Pact tactical air in Fig. S.1 and the NATO result in Fig. S.2.



**Figure S.2—Effects of Tactical Air Reduction Proposals on NATO Losses Are Modest**

## IMPLEMENTING AN AGREEMENT

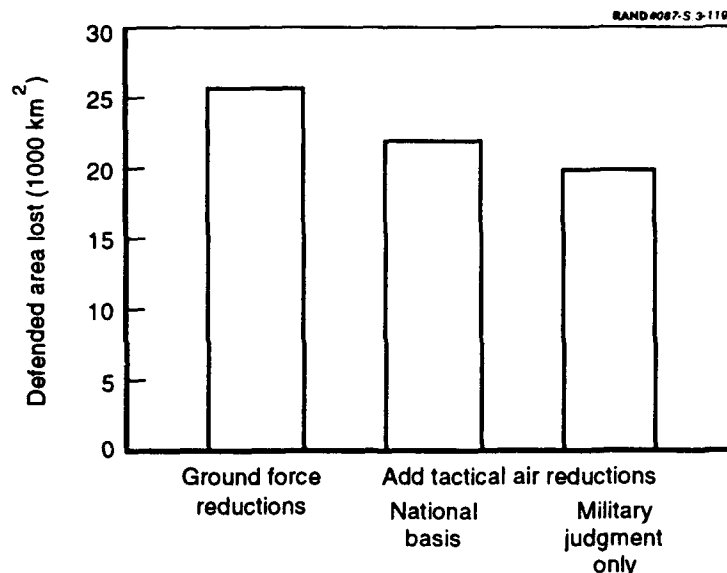
The second question of interest was how NATO might best implement any agreed-upon reductions. We examined two different hypothetical implementation schemes and their effects on NATO's defense capability:

<sup>1</sup>On February 8, 1990, NATO tabled a new tactical air reduction proposal that contained elements similar to some of those discussed in this paper.

<sup>2</sup>The CFE Treaty, signed on November 19, 1990, contains exclusions for basic trainers and some land-based naval attack aircraft but does not exclude homeland interceptors.

- Equal-percentage reductions across the NATO nations, taken according to what we believe NATO military officers would recommend based on the capability of the specific aircraft in each nation.
- Reductions taken according to military judgment about aircraft capabilities without regard to national ownership.

Figure S.3 (which uses an expanded scale) shows the effect on area lost of the two implementation options—assuming tactical air is reduced according to the original NATO proposal, i.e., a reduction to 15 percent below the NATO force level existing at the time—in comparison with the campaign where only ground force reductions are made. Although the differences in this measure of campaign outcomes are slight, nonetheless the results show there is merit in avoiding reductions according to a strict national basis. Rather, an alliance-wide perspective on reductions would maintain residual combat capability at a higher level. This means that either the reductions would be uneven across alliance nations—which may not be politically acceptable—or aircraft transfers among the nations would be needed to maintain alliance capability at the highest possible level. Fortunately, not many transfers of aircraft would be necessary. At the 15 percent level of reductions proposed by NATO, the only highly capable aircraft that would likely need to be reduced, and thus need to be transferred, are the U.S. A-10s and Canadian F-18s.



**Figure S.3—Effects of the Two Implementation Options for a 15 Percent Tactical Air Reduction**



## **ACKNOWLEDGMENTS**

Many RAND staff members contributed to this study. Particular thanks are due to Sinclair B. Coleman and Louis H. Wegner for developing the tactical air and ground force databases and producing the campaign results. Thanks are also due to Group Captain Michael Jackson, RAF, for developing the evaluation criteria for NATO's tactical air force reductions during his stay at RAND.

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## **1. INTRODUCTION**

### **BACKGROUND AND OBJECTIVES**

In March 1989, talks began in Vienna between NATO and the Warsaw Pact to reduce conventional forces in Europe (CFE). The mandate for the talks called for negotiations of conventional forces in the Atlantic-to-the-Urals (ATTU) area. Reductions of both ground and air forces were to be included in the negotiations. However, NATO's initial position was that the talks should focus first on ground force reductions and then on tactical air reductions. That approach changed in May 1989, when President Bush proposed simultaneous negotiations for reductions of tactical air and ground forces. NATO followed soon after with a formal proposal to that effect. The change in NATO's negotiating stance was the catalyst for the U.S. Air Forces in Europe's (USAFE's) request that RAND study the issues surrounding the negotiations for reducing tactical air forces.

At the time of USAFE's request, the NATO and Warsaw Pact positions on how ground forces should be reduced were quite close. In contrast, the two sides' positions on how tactical air forces should be reduced were quite far apart. In fact, for a long time it was thought that because the disagreements on tactical air reductions were so large and irreconcilable, an overall CFE agreement was in jeopardy. Consequently, many thought that tactical air forces should be removed from the CFE mandate and discussed only after a treaty had been concluded on reducing ground forces. The primary issue of this study thus was to address the following question:

- How should an agreement to reduce tactical air forces for NATO and the Warsaw Pact be structured?

If agreement on how to reduce tactical air forces could be reached, each side would have some flexibility in implementing the agreement, i.e., in selecting the aircraft that would be reduced to reach the levels specified in the agreement. Hence, the second issue of this study was to address the following question:

- How should NATO implement a tactical air reduction agreement?

## **SCOPE AND APPROACH**

The time frame for the analysis was 1989. Implications of alternative tactical air reduction proposals were determined for the ATTU region as a whole. The measures of effectiveness used in the evaluations were the ratio of Pact to NATO aircraft destroyed in accordance with a particular reduction proposal<sup>3</sup> and the ratio of Pact to NATO aircraft remaining in the ATTU region after the proposal had been implemented.

To understand the implications of the alternative reduction proposals on the two sides' ability to wage a conventional war, a campaign analysis of a Warsaw Pact attack on NATO's Central Region was conducted. That analysis first examined the implications of the reductions in Warsaw Pact and NATO ground forces to common levels that at the time were thought likely to be agreed upon. It then superimposed various tactical air reduction proposals upon the ground force reduction.

Similarly, in addressing the question of how NATO should implement a tactical air agreement, the Central Region campaign analysis examined two general principles for NATO to use in selecting which aircraft to reduce. The more favorable principle, from NATO's perspective, was then applied to each NATO country to determine the likely aircraft types for reduction and the implications for transferring or cascading aircraft from one NATO nation to another to maximize the residual capability.

## **ORGANIZATION OF NOTE**

The remainder of this Note is divided into four sections. Section 2 addresses the implications of the Warsaw Pact and NATO ground force reductions (which were fairly well in agreement at the time this study began, summer 1989) and the status of the tactical air reduction proposals (which were quite far apart in several important respects). Section 3 discusses an approach for reaching agreement on reducing NATO and Warsaw Pact tactical air forces. Considerations for NATO in implementing a tactical air reduction agreement are described in Section 4. Observations and conclusions are summarized in Section 5.

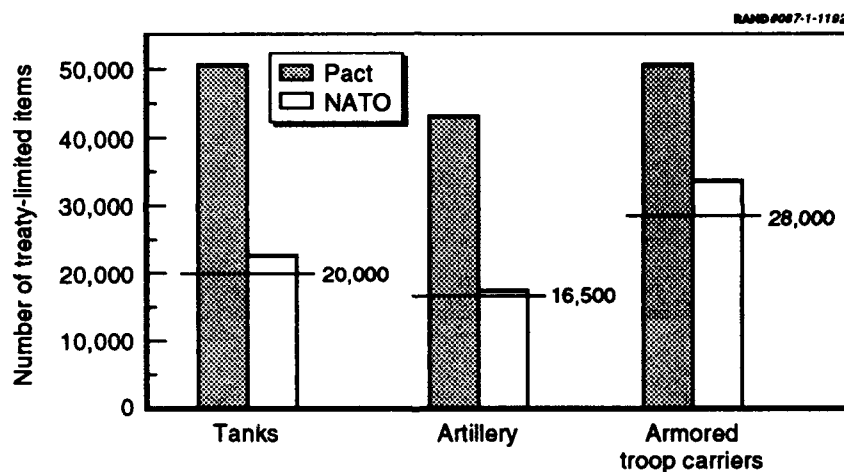
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<sup>3</sup>Both sides agreed that reduced equipment was to be destroyed or made inoperable rather than simply withdrawn from the ATTU region.

## 2. GROUND FORCE REDUCTIONS AND TACTICAL AIR PROPOSALS

### GROUND FORCE REDUCTIONS

Figure 1 shows an estimate of the NATO and Warsaw Pact inventories of the three treaty-limited ground force items for which the two sides were negotiating reductions: tanks, artillery, and armored combat vehicles. While the NATO ground force reduction proposal was more complex than shown in the chart, its essence was that both sides' forces would be reduced to common ceilings, as shown by the lines drawn across the bars.<sup>4</sup> There were two principal points. First, the Warsaw Pact would take very large reductions in absolute terms. Second, the reductions would be very asymmetrical in NATO's favor.

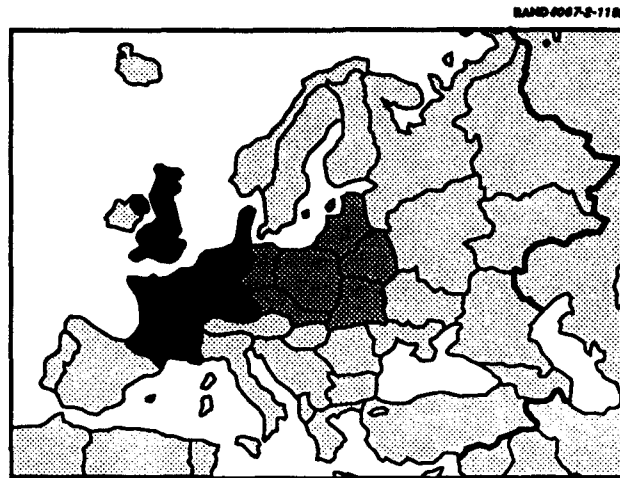


**Figure 1—Pact Ground Force Reductions Would Be Deep Under NATO Proposal**

What is the military significance of these ground force reductions? To answer that question, we analyzed an air-ground campaign in NATO's Central Region, as shown in Fig. 2.<sup>5</sup> Only conventional, nonchemical attacks were considered, and the forces evaluated were the portion of the NATO and Pact forces located in the ATTU region that we would expect to participate in a Central Region campaign.

<sup>4</sup>International Institute of Strategic Studies, *The Military Balance*, 1989-1990.

<sup>5</sup>Our focus on the Central Region was not meant to slight the importance of the flanks. We chose to concentrate on the Central Region because of the ready availability of detailed databases that made a campaign analysis of that region possible within the time constraints of this study.



**Figure 2—Central Region Campaign Analysis**

The study assumed a mobilization time prior to D-Day of 15 days for the Pact and 10 days for NATO. The evaluations were conducted assuming 1989 forces. Input data were taken principally from the Allied Air Forces, Central Europe (AAFCE) Campaign Analysis, a then-current RAND study sponsored by the AAFCE commander (COMAAFCE) to investigate NATO and Warsaw Pact tactical air employment options, and from a study of East-West conventional forces.<sup>6</sup> Campaign outcomes were evaluated using a RAND-developed theater warfare model.<sup>7</sup> Results shown are for a 20-day campaign.

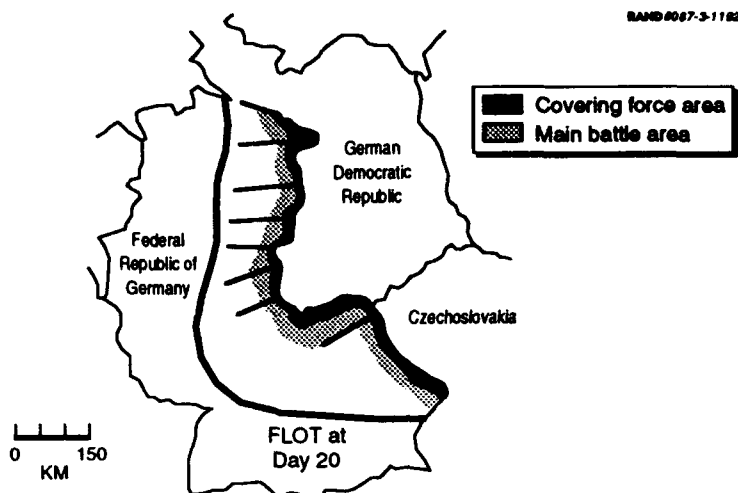
The NATO territory seized by Pact ground forces by Day 20 of the campaign for the pre-CFE situation (i.e., previous to any reductions of ground and air forces) is shown in Fig. 3. While the campaign model yields a range of results depending upon scenario assumptions and input values, the result shown here is considered to be representative of pre-CFE conditions. Half of West Germany is seized, an obvious disaster for NATO. And the situation is actually worse than shown because the ground force ratio is still considerably in the Pact's favor at Day 20, whereas further loss of NATO territory would result if the simulation were carried out beyond Day 20.

The campaign model produces a variety of measures that indicate different aspects of the outcome of the air-ground campaign (e.g., NATO aircraft killed on the

<sup>6</sup>Steve Lilly-Weber and Klaus D. Remme, *Bridging the Aircraft Gap*, Briefing Paper 2, Institute for Defense and Disarmament Studies (IDDS), June 1990.

<sup>7</sup>The analysis in this section is documented in unpublished material by colleague Richard J. Hillestad.

ground by Pact air attacks, Pact divisions delayed by NATO interdiction attacks). For simplicity, the measure we show here is defended area lost, which is defined as the NATO area seized by Pact ground forces to the west of NATO's covering force area and bounded by the FLOT (forward line of troops) at Day 20.



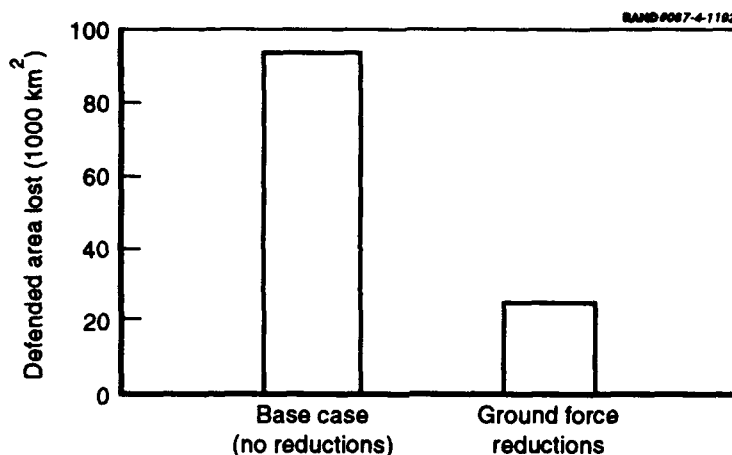
**Figure 3—Base Case Results: No Reductions  
(FLOT Position at Day 20)**

The defended area lost shown in Fig. 3 is repeated as the left-hand bar in Fig. 4. The other bar represents defended area lost after NATO and Pact ground forces have been reduced to common levels as prescribed by the similar NATO and Pact ground force reduction proposals for the CFE treaty negotiations.<sup>8</sup> The attack scenario for this case was developed to obtain the maximum amount of NATO territory seized by the Pact ground forces. Thus, it is quite different from the attack scenario used in the no-reductions case. Furthermore, conservative assumptions about NATO's ability to reinforce were made. French air forces did not become engaged until about halfway through the 20-day combat period; French ground forces were held in reserve during the 20-day conflict period. U.S. reinforcing divisions from the continental United States (CONUS) were not allowed to engage in combat until their combat support equipment and POMCUS (prepositioned overseas materiel

<sup>8</sup>In the simulation, the number of NATO and Pact tanks (in active units and in storage) was reduced to 10 percent below the then-current NATO level. Additionally, the number of NATO and Pact equivalent divisions was reduced to 10 percent below the then-current NATO level to simulate reductions in the other ground force weapon system categories of artillery and armored troop carriers.



configured in unit sets) shortfalls were moved into the theater. Even with these assumptions, which are favorable to the Pact, the defended area lost decreased greatly, i.e., to about one-quarter of that for the no-reductions case. Moreover, the ground force ratio at Day 20 favors NATO. The Pact's attack has come to a halt, and NATO may even be able to counterattack successfully. The situation is in stark contrast to what happened in the no-reductions case.



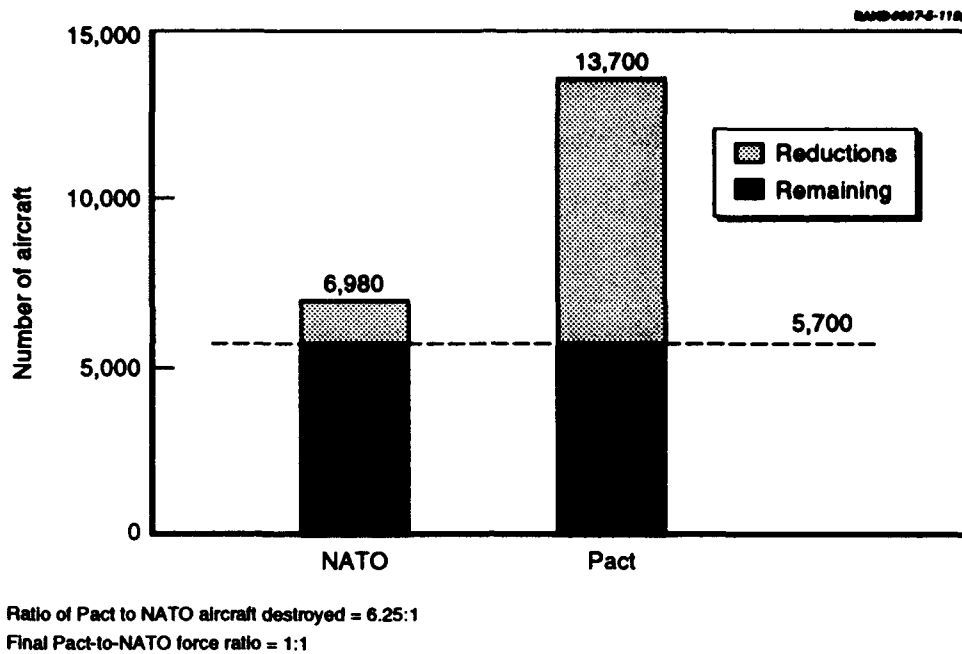
**Figure 4—Ground Force Reductions Dramatically Reduce NATO's Losses**

At the time of this study, it was widely thought that NATO and the Warsaw Pact were close to an agreement that would reduce ground forces to levels closely resembling those used in our campaign analysis. Clearly, such an agreement would have been greatly in NATO's favor because it results in such deep cuts in Pact ground forces. However, one of the major hurdles to reaching an agreement along the lines of the NATO proposal for ground force reductions was disagreement over how to reduce tactical air forces. Many believed the Pact would not agree to reduce ground forces unless there was also an agreement to reduce tactical air.

#### **TACTICAL AIR PROPOSALS**

We now turn to a review of the tactical air reductions that were being proposed by both sides. Figure 5 shows one estimate of the inventories of NATO and Warsaw Pact combat-capable aircraft based in the ATTU region (see Appendices A and B for order of battle information).<sup>9</sup>

<sup>9</sup>Lilly-Weber and Remme, op. cit.



**Figure 5—NATO Proposal: Include All Combat-Capable Aircraft; Reduce to 5700**

### **NATO Proposal**

The original NATO proposal stated that all combat-capable aircraft would be subject to the reduction agreement and that both sides would reduce their combat-capable aircraft to a common ceiling of 5700 aircraft. If this proposal had been accepted, the Pact would have had to destroy about six aircraft for each NATO aircraft destroyed. Clearly, this proposal was advantageous from NATO's viewpoint. Another feature of the NATO proposal was that it made verification relatively simple in that if an aircraft type was designated as combat capable, all aircraft of that type had to be included within the 5700-aircraft ceiling. No distinctions were to be made based on what mission the aircraft performed, where the aircraft were based within the ATTU region, or the combat organization to which they belonged.

The pre-CFE ratio of Warsaw Pact to NATO tactical air forces was about 2:1. The original NATO proposal would have resulted in force parity.

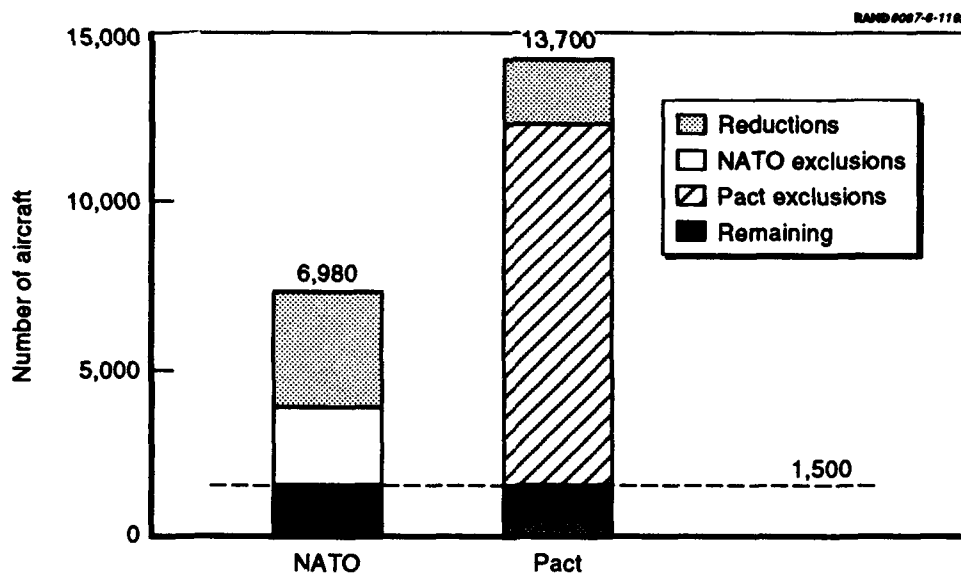
### **Original Pact Proposal**

The original Pact proposal for reducing tactical aircraft was much more narrowly focused than NATO's proposal. The Pact wanted to reduce the number of

NATO's nuclear-capable aircraft, or ground attack fighters. For NATO, ground attack fighters consist of dedicated ground attack aircraft, such as the A-10 and Tornado, and multi-mission aircraft, such as the F-16 and F-18. The Pact proposal would have limited all ground attack fighters to a common ceiling of 1500 aircraft. All other aircraft types would be excluded from the reduction agreement.

The bars in Fig. 6 show the disposition of aircraft under this proposal. For example, the bottom segment of the Pact bar indicates the Pact ground attack fighters that would remain after the proposal had been implemented, the middle segment of the bar indicates fighters not covered by the proposal, and the top segment represents the ground attack fighters that would be destroyed to stay within the 1500-aircraft ceiling.

Note that under this proposal, NATO would destroy more aircraft than the Pact. Since NATO has fewer aircraft to begin with, this proposal would thus shift the final aircraft ratio further in the Pact's favor. Needless to say, this proposal was very advantageous for the Pact and disadvantageous for NATO.



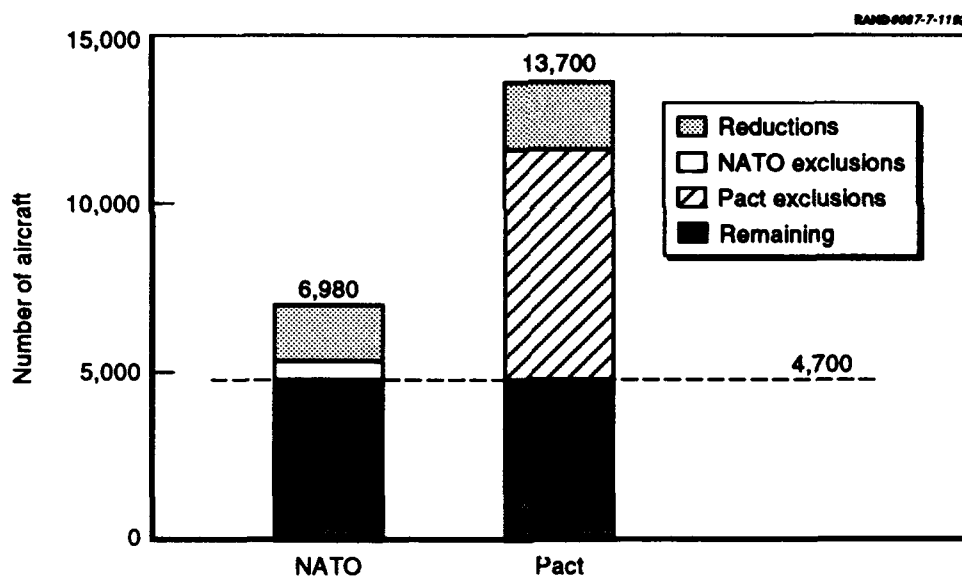
Ratio of Pact to NATO aircraft destroyed = 0.5:1  
Final Pact-to-NATO force ratio = 3.5:1

**Figure 6—Original Pact Proposal: Include Only Ground Attack Fighters; Reduce to 1500**

### Modified Pact Proposal

In the fall of 1989, the Warsaw Pact modified its tactical air proposal somewhat in the direction of the original NATO proposal. The Pact proposal would have limited frontal aviation/tactical fighters, as well as ground attack fighters. However, trainer aircraft, medium bombers (including naval variants), and homeland defense aircraft would have been excluded from the reduction agreement.<sup>10</sup> All other aircraft would be subject to a ceiling of 4700 aircraft (see Fig. 7).

If this proposal had been accepted, the Pact would have destroyed more aircraft than NATO, but the final force ratio would still have shifted somewhat further to the Pact's advantage from its pre-CFE value. The modified Pact proposal presumably would have been unacceptable to NATO because the aircraft force ratio, which was already adverse for NATO, would have worsened.



Ratio of Pact to NATO aircraft destroyed = 1.4:1

Final Pact-to-NATO force ratio = 2.1:1

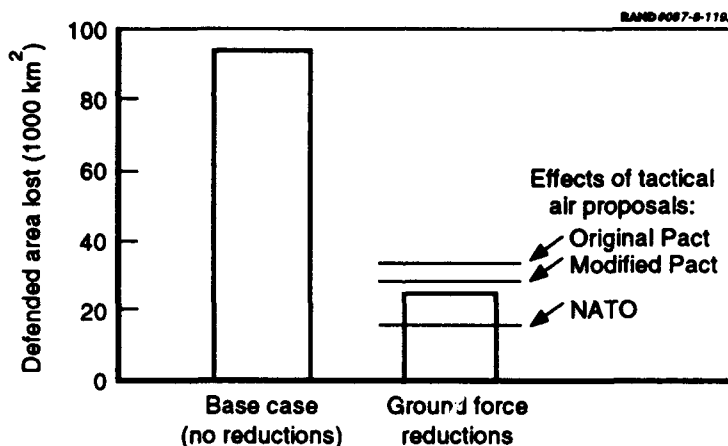
**Figure 7—Modified Pact Proposal: Include All Aircraft Except Trainers, Medium Bombers, and Soviet Homeland Interceptors; Reduce to 4700**

Given that tactical air could have been a major stumbling block to achieving a ground force reduction agreement that heavily favored NATO, the question we

<sup>10</sup>The exact types of land-based naval aircraft and homeland defense aircraft that the Pact wanted to exclude were not clear. We limited the exclusions to the most valuable types: naval medium bombers and Soviet homeland air defense aircraft.

wanted to address was, Should NATO consider compromising its tactical air reduction proposal in order to reach an overall conventional arms control agreement beneficial to NATO? Stated another way, Could NATO compromise its original position in a manner that would not harm it in a militarily significant way? To answer this question, we returned to the campaign analysis.

Figure 8 duplicates the two bars shown in Fig. 4. The left bar shows the no-reductions case; the right bar shows the case in which only the proposed ground force reductions have taken place. The three extra horizontal lines on the right bar indicate how the bar's height would be affected by the addition of the three tactical air reduction proposals. As can be seen, the results for these three proposals differ only somewhat. However, they are all considerable improvements over the no-reductions case. Thus, we concluded that NATO could compromise its original tactical air reduction proposal without harming itself in a militarily significant way, as long as it did so prudently.<sup>11</sup>



**Figure 8—Difference in Effect of Air Reduction Proposals Is Modest**

<sup>11</sup>One might say that NATO could even have accepted the original Pact proposal without doing itself great harm. However, one should keep in mind that it was thought at the time that CFE I might be followed by other negotiations (CFE II) that could result in much deeper ground force cuts. If so, low force levels would have put maneuverability of forces at a premium, and the most maneuverable force is tactical air. Consequently, during the CFE I negotiations, NATO needed to be sure it did not give away forces in a way that would come back to haunt it later—regardless of whether our analysis showed that it would have been safe to do so in a CFE I context.

### 3. SHAPING A COMPROMISE

The question at this point was, How should NATO modify its original tactical air reduction proposal to meet Pact concerns but still retain NATO's interests? To shape a compromise between the original NATO proposal (see Fig. 5) and the modified Pact proposal (Fig. 7), we started with the disposition of Pact aircraft described in the modified Pact proposal. Figure 9 shows each of the three categories of excluded aircraft—trainers, medium bombers, and Soviet homeland defense aircraft—which are discussed in turn below.

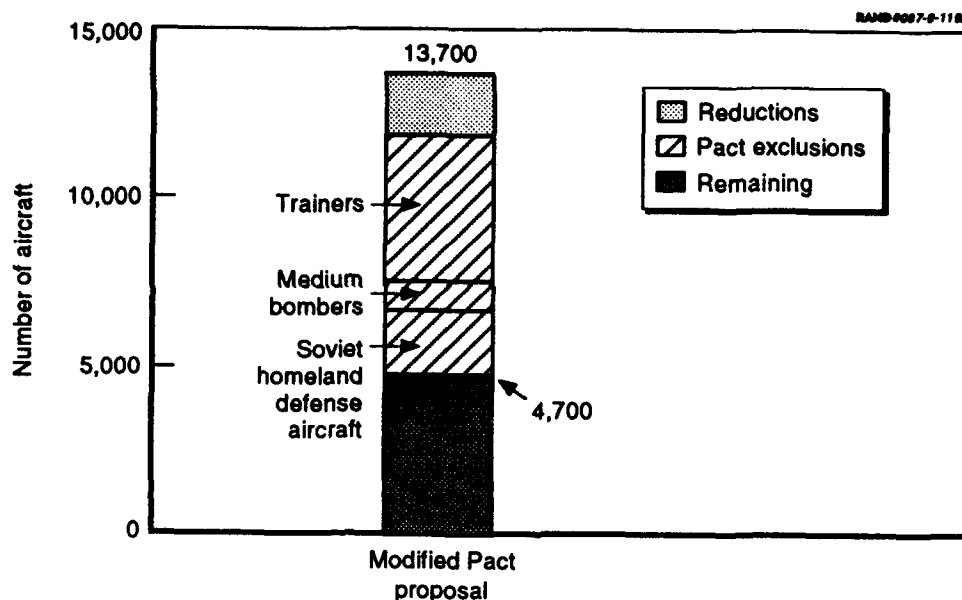
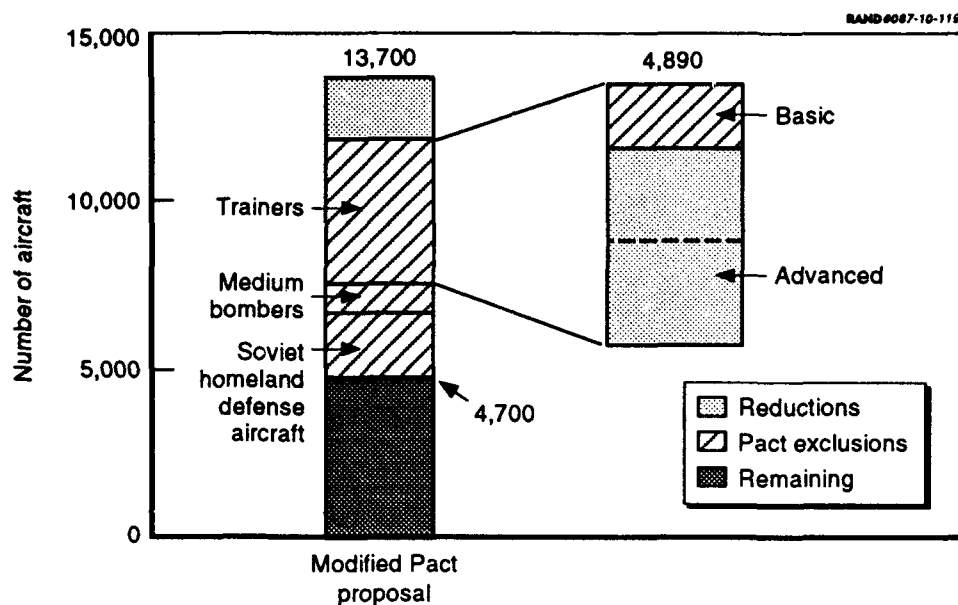


Figure 9—Shaping a Compromise

#### TRAINERS

The Warsaw Pact has about 4900 trainer aircraft in the ATTU region (see Fig. 10). Trainers can be divided into two types: basic and advanced, the first of which is used to teach junior pilots how to fly jet aircraft. About 40 percent of all Pact trainers are of the basic variety. They consist primarily of L-29 and L-39 aircraft, which have virtually no combat capability. Since they do not pose a direct threat to NATO, some of them might be excluded from a reduction agreement for both NATO and the

Pact.<sup>12</sup> We chose 1000 as the number of basic trainers for exclusion because when all aspects of the compromise are taken into account, the number of Pact aircraft remaining will be less than half the current number. Hence, the Pact presumably will need something less than half the number of basic trainers to train pilots for this reduced force.



**Figure 10—Shaping a Compromise: Trainers**

NATO has about 800 basic trainers in the ATTU region.<sup>13</sup> Thus, the 1000 ceiling on basic trainers is a level that NATO could build to (if it chose to do so).

Advanced trainers are in most cases nearly identical to the types of aircraft in frontline combat units. In contrast to basic trainers, they could play a role should combat occur, perhaps to offset attrition. Therefore, advanced trainers should be included in a reduction agreement and are so included in our compromise proposal.

<sup>12</sup>We would argue that these and all other aircraft types that might be excluded from a reduction agreement should nonetheless be capped at an agreed-upon level to avoid possible future growth.

<sup>13</sup>The predominant types are the Casa 101, CM-170, MB-339, T-33, and T-37.

## MEDIUM BOMBERS

Medium bombers can be divided into two types: (1) those equipped and organized to attack ships and (2) those designed to attack land targets (see Fig. 11).

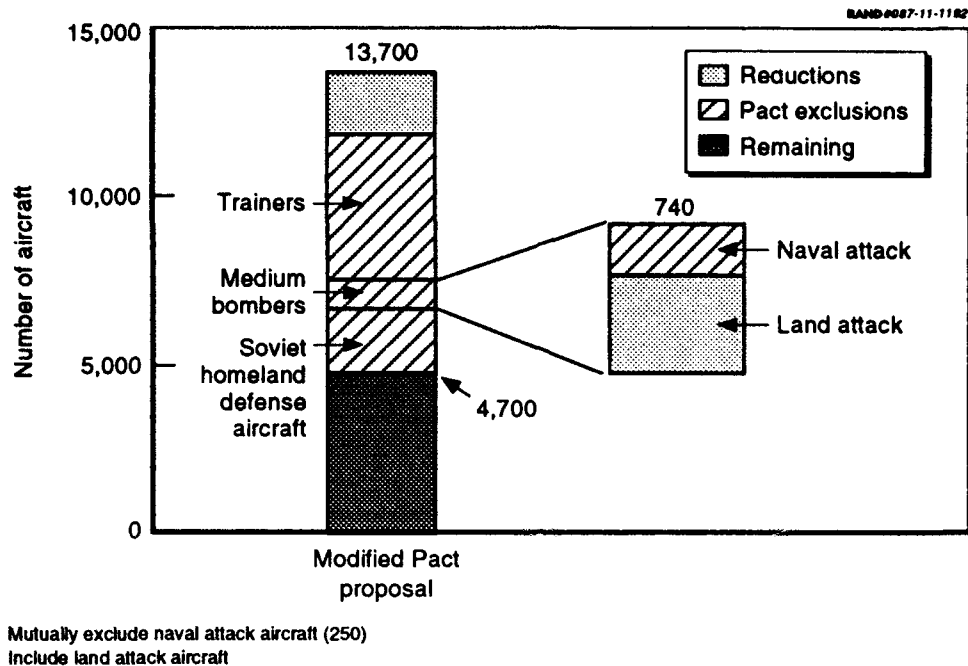


Figure 11—Shaping a Compromise: Medium Bombers

The Pact argument for not including naval attack medium bombers in a CFE agreement is that these aircraft counter NATO sea-based air, a category of aircraft not included in the CFE talks. However, NATO also uses some land-based aircraft to counter Pact surface ships and submarines—weapon system categories not included within the CFE mandate. Thus, one might fashion a compromise in which both sides are allowed to exclude an equal number of land-based naval attack aircraft. In our compromise, we chose to mutually exclude 250 land-based naval attack aircraft. That number was selected because it is the estimate of the number of Pact naval attack medium bombers.<sup>14</sup>

The other category of medium bombers—those equipped and organized for land attack—should be included in a CFE reduction agreement, because they would play an important role in a conventional European conflict. If these aircraft are not

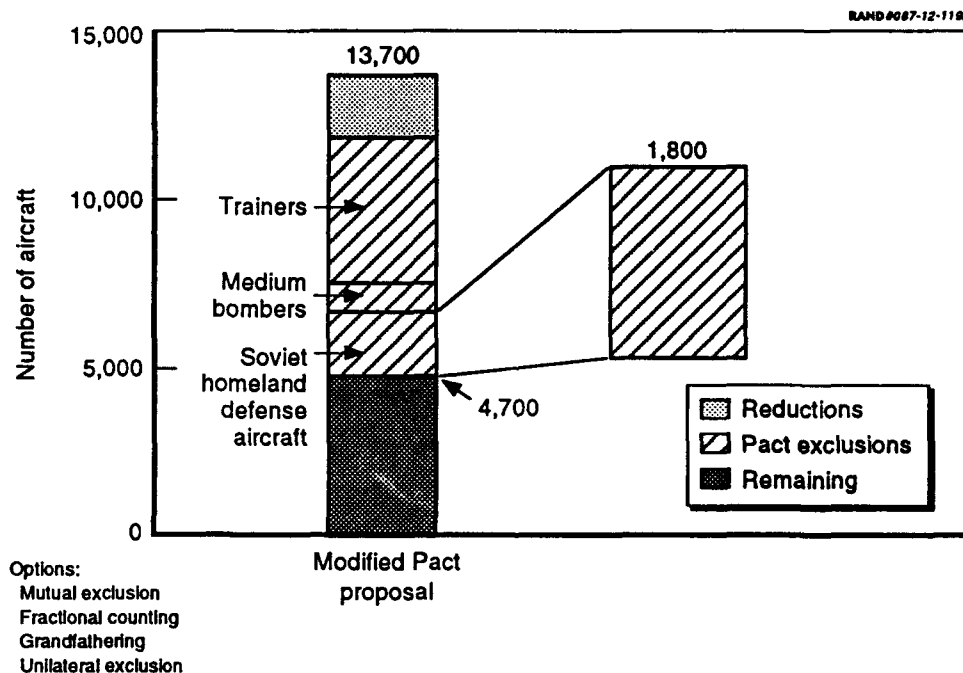
<sup>14</sup>Lilly-Weber and Remme, op. cit.



included in either the Strategic Arms Reduction Talks (START) negotiations or a CFE reduction agreement, the Pact would have a loophole that could be exploited. Thus, if these aircraft are not subject to a START limitation, they should be included in a CFE agreement.

### SOVIET HOMELAND DEFENSE

The Soviet argument for not including homeland defense aircraft in a CFE agreement is that the purpose of these aircraft is to defend the Soviet homeland against strategic nuclear attack by B-52 and B-1 aircraft and by cruise missiles, and that they would not play a role in a conventional European conflict. There are about 1800 Soviet homeland aircraft located in the ATTU (see Fig. 12).



**Figure 12—Shaping a Compromise: Soviet Homeland Defense**

This argument has a certain amount of logic and credibility. Consequently, various ways of dealing with Soviet homeland defense aircraft have been considered, four of which are as follows. The first option is to grant both sides an exclusion for a

certain number of homeland defense aircraft.<sup>15</sup> The second is to grant the Soviets a "discount rate" for homeland defense aircraft. Thus, for example, homeland defense aircraft would be included in a reduction agreement, but each such aircraft would count only as a fraction of an aircraft, say 0.3 or 0.5. The third option is to "grandfather" certain homeland defense aircraft by the date of initial operational capability (IOC). That is, an aircraft would be excluded if its IOC occurred before an agreed-upon date, but would be included if it were replaced by an aircraft with an IOC that occurred after that date.<sup>16</sup> The final option is to essentially agree with the Soviet argument and grant them a unilateral exclusion for some number of homeland defense aircraft.

Of the three types of aircraft that the Pact wanted to exclude—trainers, medium bombers, and homeland defense aircraft—we thought<sup>17</sup> that the Pact would hold most strongly to their position on homeland defense aircraft. In shaping our compromise proposal, we selected the fourth option for homeland defense aircraft—the option most in the Soviets' favor. Even so, NATO could still achieve a very favorable tactical air reduction agreement.

#### **SUMMARY OF COMPROMISE**

The results of the mutual and unilateral exclusions just discussed are summarized in Fig. 13. To reiterate, 1000 basic trainers<sup>18</sup> and 250 land-based naval attack aircraft were excluded from both sides, and the Pact was granted a unilateral exclusion for 1800 homeland defense aircraft. All other aircraft were subject to reductions of 15 percent below the current NATO level.

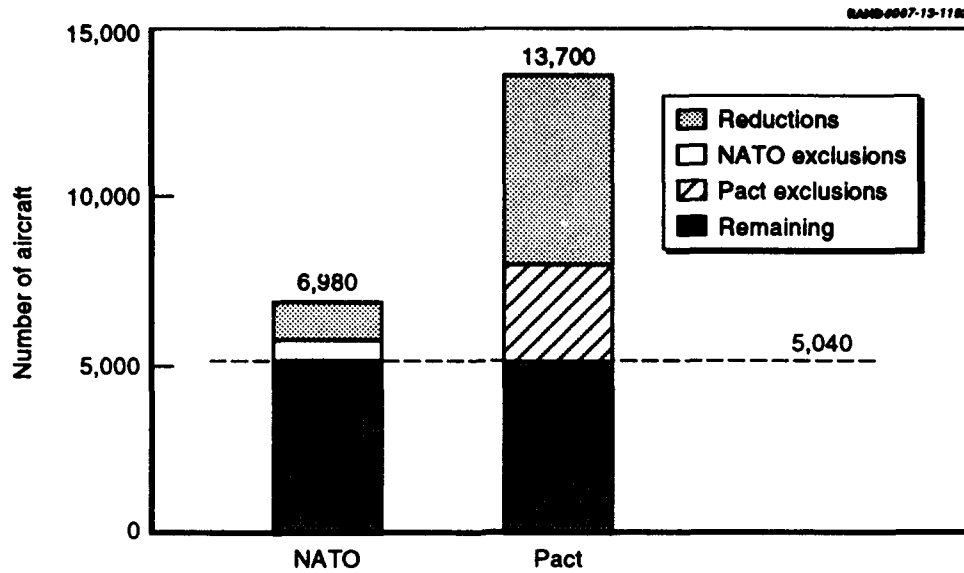
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<sup>15</sup>Mutually excluding certain numbers of aircraft and limiting the remaining numbers to a common ceiling is essentially equivalent to the original NATO proposal. Rather than putting forward a more complicated proposal that is essentially equivalent to the original one, NATO may as well stick to its simpler, original proposal. Thus, we do not consider further a mutual exclusion of homeland defense aircraft.

<sup>16</sup>Various combinations of discount coefficients and IOC dates have been suggested.

<sup>17</sup>Wrongly, it turned out.

<sup>18</sup>It is estimated that NATO has about 800 basic trainers at present. The results shown here assume that NATO does not exercise its prerogative to build up to the 1000 basic trainer ceiling.



Ratio of Pact to NATO aircraft destroyed = 6.3:1

Final Pact-to-NATO force ratio = 1.3:1

**Figure 13—A Possible Compromise: Mutually Exclude Some Basic Trainers and Naval Attack Medium Bombers; Exclude Soviet Homeland Defense; Reduce Other Aircraft to 15 Percent Below NATO Level**

With this reduction compromise, the Warsaw Pact would have to destroy more than six aircraft for each NATO aircraft destroyed. Furthermore, the final Warsaw Pact-NATO force ratio of 1.3:1 would be a considerable improvement over the current 2:1. Although this final ratio is not unity, as it is in the NATO proposal, this modified proposal does capture the most threatening Pact aircraft from a conventional conflict perspective. Moreover, if U.S. reinforcing aircraft from CONUS are included in the NATO total,<sup>19</sup> the final force ratio is close to unity.

Figure 14 shows the campaign analysis result for the compromise tactical air reduction proposal, along with the results for the three other tactical air reduction proposals discussed earlier and shown in Fig. 8. The compromise and NATO proposals produce essentially the same campaign result. The reason for the similar outcomes is that the exclusions contained in the compromise proposal (i.e., basic trainers, naval attack medium bombers, and Soviet homeland defense aircraft) were not involved in the Central European campaign. We believe that with but few

<sup>19</sup>CONUS reinforcements are not based in the ATTU region and therefore were not included in the CFE negotiations.

exceptions, this is a fair representation of likely Soviet/Warsaw Pact wartime force employment concepts. Thus, we conclude that our compromise proposal satisfies NATO's essential interests while also satisfying the major Pact demands.

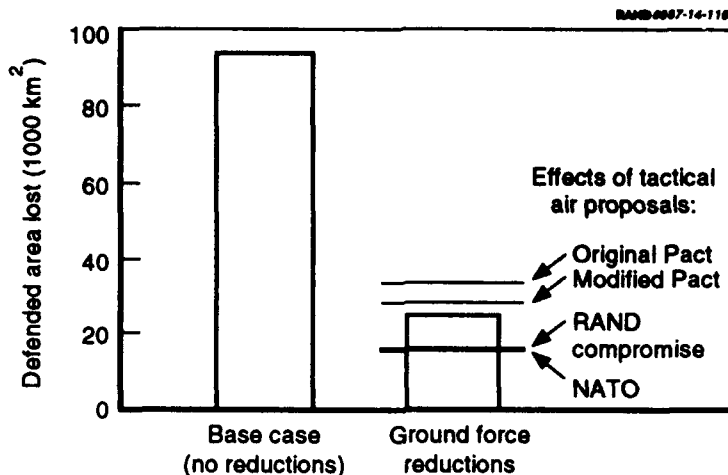
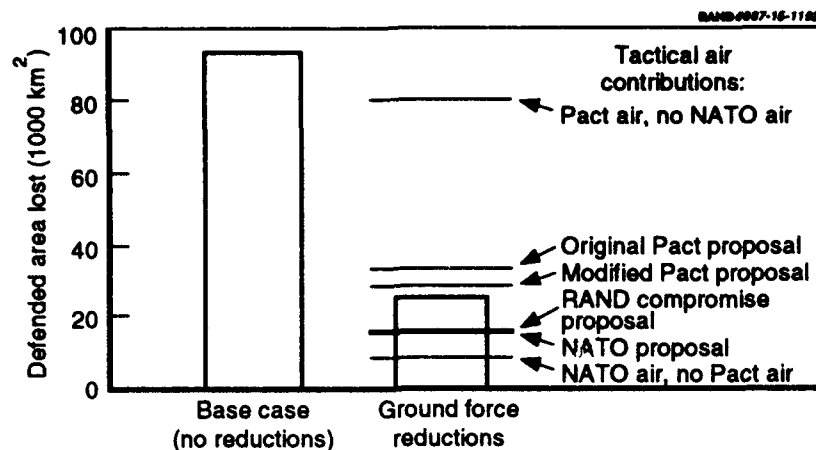


Figure 14—Effects of Tactical Air Proposals Are Modest

#### CONTRIBUTION OF TACTICAL AIR

From the campaign results for the four tactical air reduction proposals discussed so far, one might conclude that tactical air has little effect on the outcome of the ground battle. Such a conclusion would be incorrect. To better understand the contribution of tactical air, we examined two very extreme campaign cases: the situation in which NATO tactical air is eliminated and Pact tactical air remains unchanged, and the opposite situation, in which Pact tactical air is eliminated and NATO tactical air remains unchanged. As the extreme cases in Fig. 15 show, NATO's tactical air has a very significant effect on the ground battle. However, as long as the two sides retain sizable inventories of tactical aircraft, as in the cases examined here, modest changes in those inventories will have only modest effects on the ground battle. Even so, since the extremes of the tactical air reduction proposals (the original Pact proposal and the NATO proposal) show a  $\pm 30$  percent change in the ground battle result, we conclude that tactical air does make a difference.<sup>20</sup>

<sup>20</sup>There are several reasons that defended area lost does not change much in this scenario when modest changes are made in tactical air. First, when NATO and Pact ground forces are equal in terms of equivalent divisions, the ground battle situation is extraordinarily stable. Second, we do not credit Pact tactical air with particularly capable air-to-ground munitions. Therefore, reductions in Pact aircraft have a small effect on the course of the



**Figure 15—NATO Tactical Air Makes an Important Contribution**

On November 19, 1990, after this study was completed, NATO and Warsaw Pact member states signed the CFE Treaty in Paris. The basic elements of the treaty that pertain to tactical air forces are

- Each alliance can have 6800 combat aircraft.
- Basic trainers are excluded from the 6800 combat aircraft total.
- Maritime patrol aircraft are excluded.
- The Pact can convert up to 550 advanced trainers to basic trainers.
- Aircraft formerly belonging to East Germany now count against NATO totals.

Additionally, a separate agreement excludes from the CFE ceiling 430 land-based naval attack aircraft for each side.

Even when the former East German aircraft are added to the NATO total, the exclusion provisions for maritime patrol aircraft, basic trainers, and land-based naval attack aircraft mean that NATO will not have to destroy any aircraft to meet the CFE ceiling. We estimate that the Warsaw Pact countries will have to destroy approximately 3700 aircraft. The final Pact to NATO force ratio will be 1.25:1 if both sides take full advantage of the CFE provisions but do not increase basic trainers and maritime patrol aircraft beyond current inventories.

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ground battle. Finally, since U.S. reinforcing aircraft are not included in the CFE mandate, the effects of a reduction in NATO aircraft based in the ATTU region are somewhat dampened.

Although we did not run a campaign representing the tactical air reduction provisions of the actual CFE Treaty, we estimate that the result would fall somewhere between the bottom two tactical air contribution cases in Fig. 15, i.e., between the "NATO proposal" and the "NATO air, no Pact air" results.

#### 4. IMPLEMENTING THE REDUCTIONS

The next step in our study was to examine ways in which NATO might implement a tactical air reduction agreement. We used NATO's original tactical air proposal (recall that this work was completed before the final CFE Treaty was negotiated), which called for a 15 percent reduction of all NATO tactical air forces. We addressed two possible implementation approaches:

1. Reductions made on a "fair share" basis, i.e., each nation reduces the size of its air force by 15 percent.
2. Reductions made based on RAND's perception of how military judgment would dictate with no regard for national ownership.

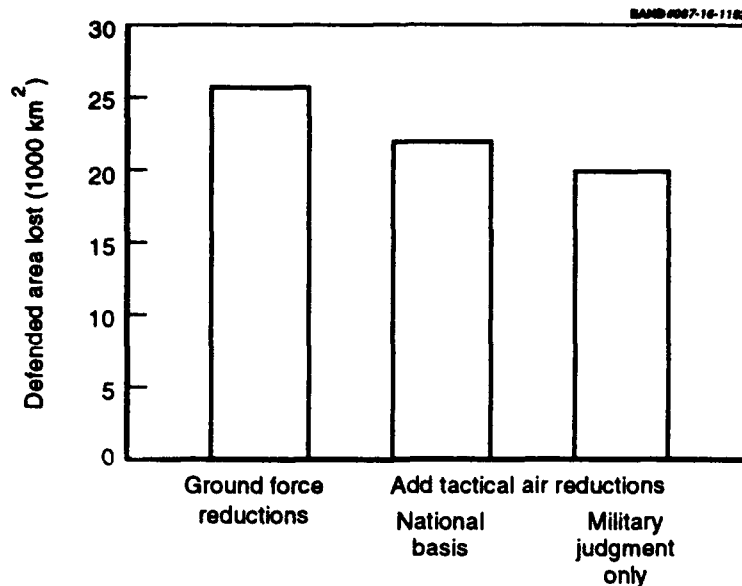
Figure 16 compares the two ways of implementing NATO's tactical air reductions. The bar on the left is the result for ground force reductions only. (The bar appears larger than it did in earlier figures because of a change in scale.) The other two bars show what occurs when tactical air reductions are added to the ground force reductions via the two approaches.

Understandably, the result for the case in which national ownership is not a factor in the selection of which aircraft to reduce (i.e., when reductions are made solely on the basis of military judgment) is better for NATO than when national ownership is a factor.

Therefore, if the combat capability of NATO's residual tactical air force is to be maximized, either reductions will have to be taken unevenly across the alliance nations, or aircraft transfers among the nations will have to occur. Most observers believe that it will be very difficult (and perhaps even undesirable) politically to agree to anything but equal percentage cuts.<sup>21</sup> That leaves aircraft transfers as the way to retain highly capable aircraft within the alliance that would otherwise be destroyed.

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<sup>21</sup>With the dissolution of the Warsaw Pact, the virtual disappearance of a conventional military threat to Western Europe, and the reduction in defense budgets across the alliance, the sentiment against taking larger than average cuts in force levels has probably disappeared in many NATO nations.



**Figure 16—Effects of Tactical Air Implementation Options for a 15 Percent Reduction**

The transfer of large numbers of aircraft within the alliance will likely prove to be difficult for the following reasons:

- Some nations may be reluctant to accept aircraft because of industrial and economic considerations. For example, a country that is producing aircraft might be reluctant to accept “free” aircraft if doing so means a loss of jobs.
- A nation may be reluctant to accept a small number of an aircraft type not already in its inventory if the costs of providing the infrastructure to support that aircraft are large.
- National air forces may have differing views on how to fight an air war. If an aircraft type does not complement a nation’s air doctrine, that nation will be reluctant to accept it.
- Finally, evenhandedness and other subregional military balance considerations within the alliance may hamper the transfer of aircraft to certain nations.

If transfers of large numbers of aircraft are going to be difficult to achieve, the question that arises is, How many *highly capable* aircraft that would otherwise be destroyed need to be transferred?



The current (as of 1989) NATO aircraft inventory is shown in Fig. 17. The national inventories are coded by aircraft age and special capabilities (e.g., maritime patrol aircraft). Here, we distinguish between aircraft that are dated but still have good capability (e.g., F-4s) and those that are simply dated (e.g., F-84s).

Figure 18 is a duplicate of Fig. 17 except that the bottom of each bar is marked to indicate the number of aircraft that nation will have to destroy to reach the 15 percent reduction level. For almost all nations, only dated aircraft with little capability will be affected. The two exceptions are the United States and Canada.

We estimated which aircraft each NATO nation would offer up to meet its 15 percent reduction goal. We then added up the aircraft reductions by type to produce Fig. 19. For each aircraft type, we made a subjective judgment concerning the value of keeping that aircraft type in the NATO inventory rather than having it destroyed. A cascading value of four represents the most desirable aircraft to retain. As can be seen, only a small number of aircraft have ratings of three or four. The principal focus should be on retaining the highly capable aircraft (of which only a small number are subject to reduction), although NATO should still be concerned with the transfer of aircraft types whose ratings are lower, but not overly so.

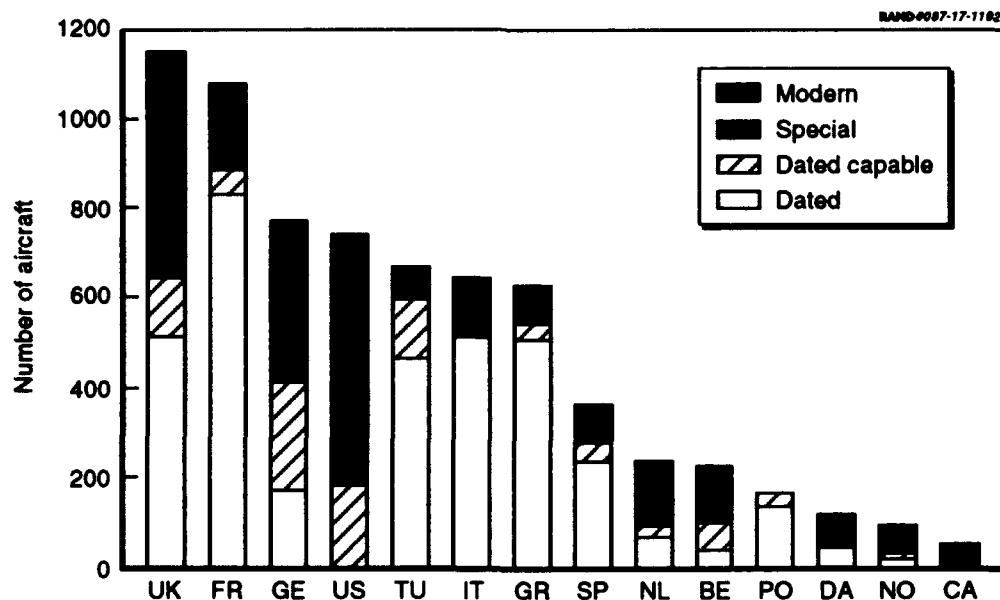


Figure 17—Current NATO Inventory

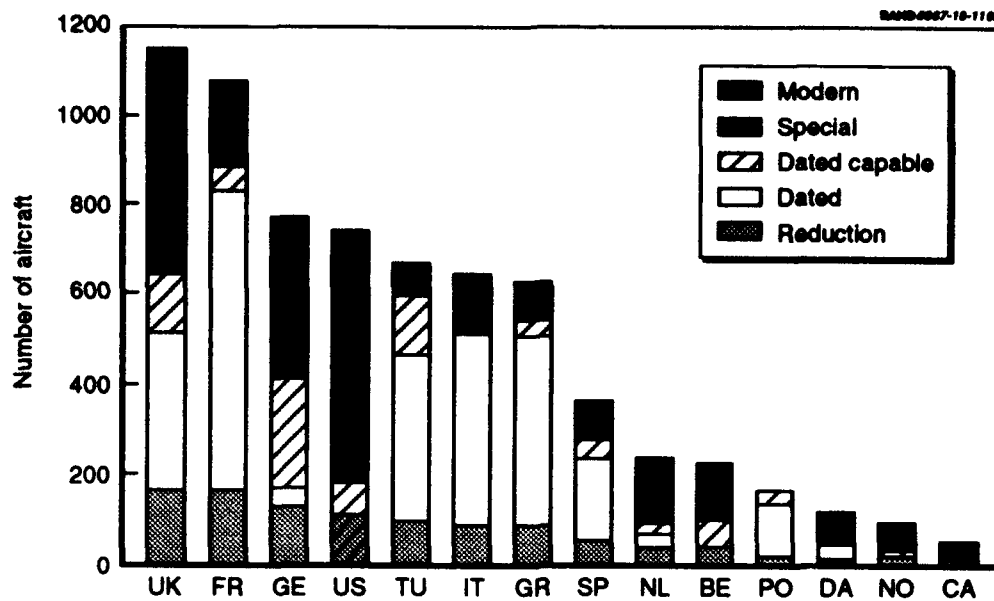


Figure 18—Implementation of 15 Percent Reduction

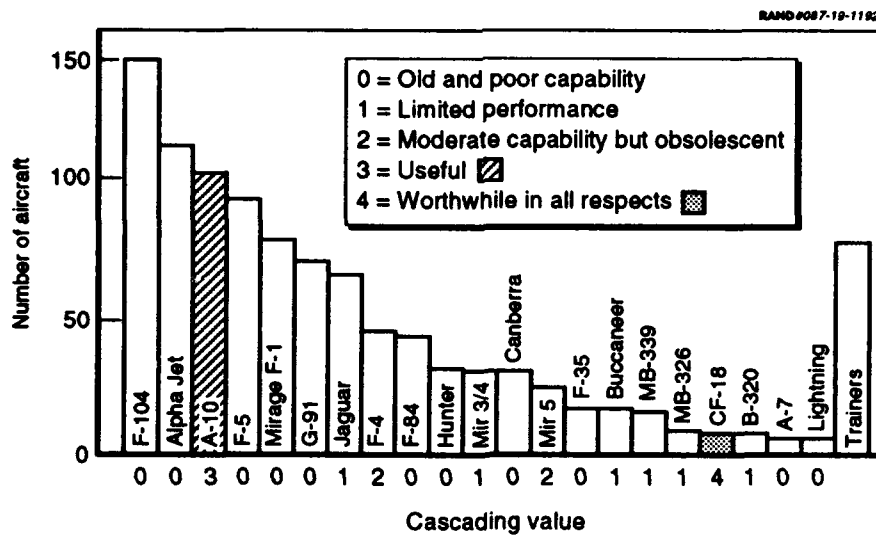


Figure 19—Aircraft Types Reduced at 15 Percent Level

At a 15 percent reduction level, about 120 highly capable aircraft would have to be transferred. They consist of U.S. A-10s and Canadian F-18s.<sup>22</sup> However, because of the small size of the Canadian air forces stationed in Europe, NATO could exempt that nation from cutting its force and instead offer to absorb Canada's share of the reductions within other NATO nations' reductions. If NATO takes this course, the transfer problem essentially reduces to finding a home for just the U.S. aircraft. And even if NATO does not take this course, the smaller number of transfers required when the highly capable aircraft are focused on may make the transfer problem more manageable than previously thought.

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<sup>22</sup>The United States could offer to reduce a mix of A-10s and F-16s rather than just A-10s. Doing so would not, however, affect the number of highly capable aircraft that need to be retained through transfer.

## 5. OBSERVATIONS AND CONCLUSIONS

The major NATO advantage to be gained from a CFE agreement was that the Warsaw Pact would make very large and highly asymmetrical cuts (in NATO's favor) in its major ground force equipment. Many people believed, however, that the Warsaw Pact was not about to agree to such cuts until the two sides agreed on how tactical air forces should be reduced. The two sides submitted tactical air proposals, but even after some differences were narrowed, they were still far apart on how to treat three categories of aircraft: trainers, medium bombers (including land-based naval attack aircraft), and homeland defense aircraft.

Because NATO stood to gain a great deal from the ground force reductions, it could think about modifying its tactical air reduction proposal in ways that it might not consider acceptable if only tactical air was on the negotiating table. We suggested a compromise that yields on points presented by the Pact but retains NATO's vital interests. We suggested that each side be allowed to exclude some number of basic trainers and land-based naval attack aircraft, and that the Soviets be granted a unilateral exclusion for some number of homeland air defense aircraft. The CFE Treaty contains elements of our suggested exclusions on trainers and land-based naval attack aircraft. However, although NATO did propose an exclusion for homeland air defense aircraft toward the end of the negotiations, it was not included in the final CFE Treaty.

The CFE treaty does not require NATO to reduce its inventory of combat aircraft. The reason no reductions are necessary stems from the specific aircraft excluded from the tactical air provisions and the fact that the treaty ceiling on combat aircraft (6800 aircraft) is above the number of aircraft possessed by the NATO nations (6700 aircraft).<sup>23</sup>

If the original ceiling proposed by NATO (5700 aircraft) had been accepted, NATO would have had to reduce its combat aircraft by 15 percent. To achieve that level of reduction while maximizing the capability of its residual air force, NATO would have had two choices: make uneven reductions across nations—an unlikely event except in special circumstances—or transfer highly capable aircraft between nations to prevent them from being destroyed. Most observers feel that transferring

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<sup>23</sup>The 6700 figure does not include East German aircraft that now must be included in the NATO total.

large numbers of aircraft among the NATO nations would be at best a very complex process. However, at a 15 percent reduction, only slightly more than about 100 highly capable aircraft would have to be transferred (or otherwise destroyed). From a numerical perspective, then, the aircraft transfer problem would have been quite manageable.

**Appendix A**  
**NATO COMBAT AIRCRAFT AND TRAINERS IN THE ATTU REGION<sup>1</sup>**

Type Aircraft	Bel	Can	Den	FRG	Fr	Gr	It	Neth	Nor	Por	Sp	Tur	UK	US	NATO
Combat Aircraft															
A-7						50				40				116	90
A-10															116
Alpha Jet	31			170	160										361
AM-X							5								5
Atlantic				19	40		18								77
Buccaneer				2									70		70
Canberra												65			67
CF-18		53											130		53
F-4 Phantom				230		50					44	130		64	648
F-5						100		80	30		50	130			390
F-15						40								131	131
F-16	115		63					140	60			65		263	746
F-18											70				70
F-35			43												43
F-84						60									60
F-100															0
F-104				27		110	200					240		170	577
F-111															170
G-91				15			170			55					240
Guardian					5										5
Harrier													120		120
Hawk													150		150
HU-16 Albatross													80		80
Hunter						12							140		300
Jaguar					160								5		5
Lightning															
Mirage F-1				200		30					60				290
Mirage III				140							23				163
Mirage IV				30											30
Mirage 5	65			40											105
Mirage 2000				130		40									170

<sup>1</sup>Source: Lilly-Weber and Remme, op. cit.

Type Aircraft	Bel	Can	Den	FRG	Er	Gr	It	Neth	Nor	Por	Sp	Tur	UK	US	NATO
Nimrod													37		37
P-3								13	6	6	6			5	36
PD-808							10								10
S-2												22			22
Shackleton													11		11
Tornado				215			95						310		720
Total	211	53	106	778	905	492	498	233	96	101	253	587	1,118	749	6,180

#### Basic Trainers

Casa-107										85					85
CM-170	18				180										198
E-26 Tamiz											34				34
MB-326							75								75
MB-339							95								95
T-2						35							15		50
T-27													20		20
T-33						60				15		30			105
T-37(a)						35				25		40			100
T-38(a)										12		27			39
Total	18	0	0	0	180	130	170	0	0	52	119	97	35	0	801

Grand Total	229	53	106	778	1,085	622	668	233	96	153	372	684	1,153	749	6,981
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# Appendix B

## WARSAW PACT COMBAT AIRCRAFT AND TRAINERS IN THE ATTU REGION<sup>1</sup>

Type Aircraft	Bul	Czech	GDR	Hun	Pol	Rom	USSR	Total
<b>Combat Aircraft</b>								
An-12							17	17
Be-12							65	65
IAR-93						20		20
Il-20 + Il-22							25	25
Il-28					25	10		35
Il-38							25	25
L-29		15					15	15
MiG-15					10	20		30
MiG-17					85	85		170
MiG-21	149	296	214	128	445	200	650	2,082
MiG-23	75	89	79	11	45	45	2,155	2,499
MiG-27							585	585
MiG-25	3						570	573
MiG-29	10		22		11		725	768
MiG-31							250	250
Su-7					35		80	115
Su-15							385	385
Su-17							750	750
Su-20					90			90
Su-22	21	47	70	11	80			229
Su-24							740	740
Su-25	39	43					240	322
Su-27							260	260
Tu-16							353	353
Tu-22							130	130
Tu-26							255	255
Tu-95							155	155
Tu-142							30	30
Tu-160							20	20
Yak-28							95	95
<b>Total</b>	<b>297</b>	<b>490</b>	<b>385</b>	<b>150</b>	<b>826</b>	<b>380</b>	<b>8,560</b>	<b>11,088</b>
<b>Basic Trainers</b>								
IAR-28						10		10
IAR-823						50		50
IAR-825						15		15
L-29 + L-39	102	100	100	10		75	2,000	2,387
Of which: L-29	84			10		40		
L-39	18	100	100			35		
PZL-130					7			7
TS-8					50			50
TS-11					50			50
Zin 43		30						30
Zin Z526		20						20
<b>Total</b>	<b>102</b>	<b>150</b>	<b>100</b>	<b>10</b>	<b>107</b>	<b>150</b>	<b>2,000</b>	<b>2,619</b>
<b>Grand Total</b>	<b>399</b>	<b>640</b>	<b>485</b>	<b>160</b>	<b>933</b>	<b>530</b>	<b>10,560</b>	<b>13,707</b>

<sup>1</sup>Source: Lilly-Weber and Remme, op. cit.